



## LAYERED FILM SHEET FOR COATING

### BACKGROUND OF THE INVENTION

#### 1. Field of the invention

The present invention relates, in general, to a layered film sheet for coating a sheet-like subject and, more particularly, to a layered film sheet which can clearly preserve a sheet-like subject for a semipermanent period <sup>as an</sup> ~~with~~ elegant and archaic expression.

#### 2. Description of the <sup>Related</sup> ~~Prior~~ Art

In order to protect and/or decorate a sheet-like subject with its appearance being visible, <sup>a vacuum laminix process</sup> ~~there~~ has been conventionally <sup>used</sup> ~~used a vacuum laminix process~~. According to this process, a piece of cloth or an embossed plate is applied over a folded polyethylene film between which the subject, for example, a photograph, a print, a picture, etc., is inserted, and then pressurized at an elevated temperature under a vacuum condition, so as to allow the subject to be embossed and tightly shielded. However, this conventional laminating process is very complicated and inefficient. In addition, polyethylene cannot <sup>create an</sup> ~~afford~~ archaic and elegant expression owing to its luster or gloss.

Another method for the coating of a sheet-like subject is

to use a film-transferable, laminating sheet in which a polyethylene liquid type film is formed on a high-melting temperature thermoplastic film of high releasability or on a sheet of paper which has experienced a release treatment.

5 Such a sheet, however, cannot provide a high quality texture ~~because of~~ <sup>luster. it is</sup> ~~sense due to its luster in addition to being~~ poor in the adhesion to subjects and in durability because it is ~~feasible~~ <sup>easily</sup> ~~to be~~ torn owing to its thin and weak coating film.

Further, <sup>a laminating sheet has been</sup> ~~there is~~ developed ~~a laminating sheet~~ in which a polyester film overlays a polyethylene film with the aim of reinforcing the weak physical properties of polyethylene. The sheet which has a polyester film as the outmost layer suffers from a disadvantage of being unable to obtain a decoration effect because the polyester film is virtually impossible to emboss and readily damaged along its folded line.

### *Brief* SUMMARY OF THE INVENTION

20 Therefore, it is an object of the present invention to overcome the above problems encountered in <sup>the prior art.</sup> ~~prior arts~~ and to provide a layered film sheet which can coat a sheet-like subject with elegant and archaic expression.

25 It is another object of the present invention to provide a layered film sheet which can preserve a sheet-like subject for a semipermanent period.

It is a further object of the present invention to provide a layered film sheet which does not droop and cling to rollers during coating.

Based on the present invention, the above objects could be <sup>achieved by</sup> ~~accomplished by a provision of~~ a layered film sheet for coating a sheet-like subject, in which an embossed polyvinyl chloride film exists as an outermost layer and an EVA film serves as an innermost layer to be in direct contact with the subject when the film sheet is folded to coat the <sup>subject,</sup> ~~subject,~~ <sup>there is</sup> ~~with~~ a low density polyethylene film, an EVA film and a polyester film ~~being~~ intermediately inserted between the two layers, in due order from the outermost to the innermost layer, the LDPE film being bonded to the outermost layer via a water-miscible acryl-based adhesive, <sup>and</sup> the polyester film being bonded to the innermost layer via a water-miscible acryl-based adhesive.

In the layered film sheet for coating, the innermost layer is softened and <sup>made adhesive</sup> ~~of adhesion~~ at low temperatures and thus, the total coating process can be conducted at decreased temperatures so that the outermost PVC film can be expressed in effective embossed patterns. Also, such low-temperature coating prevents the heat deterioration of the subjects, such as pictures, prints, and paleography. The low coating temperature can afford a clear product which is free of speckles resulting from the spreading or running of gelatin on

a photograph or ink on a print when it is melted at high coating temperatures. In addition, a subject, when being coated with the layered film sheet, can be semi-permanently preserved due to the excellent air tightness of the layered film sheet. Moreover, the employment of the dull and embossed PVC film allows the layered film sheet to be of high-toned and archaic texture.

BRIEF DESCRIPTION OF THE ~~INVENTION~~ <sup>DRAWINGS</sup>

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying ~~drawings~~ <sup>drawings</sup>, in which:

Fig. 1 is a perspective view showing the coating of a sheet-like subject with the layered film sheet of the present ~~invention~~ <sup>invention</sup>;

Fig. 2 is a cross sectional view showing the coating of a sheet-like subject with the layered film sheet of the present ~~invention~~ <sup>invention</sup> and

Fig. 3 is a partially enlarged view of part A of Fig. 2.

DETAILED DESCRIPTION OF THE ~~PREFERRED EMBODIMENT~~ <sup>INVENTION</sup>

The present invention is directed to a layered film sheet



for coating sheet-like subjects. With reference to Fig. 1, there is shown the coating of a sheet-like subject with the layered film sheet of the present invention. As seen in Fig. 1, a sheet-like subject 8, such as a photograph, a picture, a piece of cloth, a print, etc., is placed on one half of one surface of the layered film sheet and the layered film sheet is folded for the other half to cover the exposed face of the subject. Accordingly, the surfaces of the subject are brought into direct contact with only one surface (represented by reference numeral 7 in Fig. 1) of the layered film sheet. Meanwhile, the other surface (represented by reference numeral 1 in Fig. 1) of the layered film sheet exclusively composes the surface of the resultant coating.

In accordance with the present invention, the layered film sheet has a multi-layer structure of thermoplastic thin films, in which an embossed PVC film 100 microns thick exists as an outermost layer and an EVA film with a thickness of 25-30 microns serves as an innermost layer to be in direct contact with a ~~subject~~ <sup>Subject. There is</sup> with a low density polyethylene film (hereinafter referred to as "LDPE"), an EVA film and a polyester film ~~being~~ intermediately inserted in due order from the outermost to the innermost layer, ~~said~~ <sup>the</sup> LDPE film 20 microns thick being bonded to the outermost layer via a water-miscible acryl-based adhesive, ~~said~~ <sup>and the</sup> polyester film 11-12 microns thick being bonded to the innermost layer via a water-

miscible acryl-based adhesive.

With reference to Fig. 2, there is a cross-section in which the layered film sheet of the present invention is being folded to coat a sheet-like subject 8. A detail structure of the layered film sheet of the present invention is shown in a partially enlarged view of Fig. 3, taken from part A of Fig. 1. As seen, the ~~multi~~<sup>multi-layered</sup> structure of the present invention comprises, in the layered order from top to bottom, a 100 micron-thick embossed PVC film layer 1, a water-miscible acryl adhesive layer 2, a 20 micron-thick LDPE film layer 3, a 20 micron-thick EVA film layer 4, a 11-12 micron-thick polyester film layer 5, a water-miscible acryl adhesive layer 6, and a 25-30 micron EVA film layer 7.

For the construction of this multi-layer structure, first, a molten EVA resin is spread and cured on one side of a polyester film by T-die coating. The same process is also true of the formation of a LDPE layer on the resulting EVA coating. Separately, an acryl adhesive is applied on one side of a PVC film by roller coating. To this bi-layer structure, the above LDPE-EVA-PET structure is bonded by pressurizing with a pair of engaged rollers in such a way that the adhesive layer faces the LDPE layer. On the exposed side of the PET layer in the resulting quintuple structure, a water-miscible acryl adhesive layer is formed by roller coating and dried to some degree, followed by applying a molten EVA resin on the

water-miscible acryl adhesive layer through T-die coating by means of a coating roller. The water-miscible acryl adhesive is prepared from a composition consisting of 1 : 3 : 1 <sup>ratios of solid</sup> ~~a solid~~ content : water : methanol. Although no heat is applied when the adhesive is coated, it is spontaneously cured by the heat which is used when other layers are laminated.

As mentioned above, the EVA and LDPE film layers of the layered film sheet of the present invention are not recruited as ready-made films, but formed from solutions of low melting point resins by T-die coating. EVA, if not exhibiting adhesiveness at low temperatures, is a typical hot melt resin with low melting and softening temperatures, which can be tackified by heat and/or pressure.

Useful for the present invention is a softened PVC film which is modified by the addition of a plasticizer for the embossing and laminating purpose of the present invention. Its surface may be converted from being lustered into being dull by a provision of various senses to the touch and/or the sight, such as canvas texture, fine texture, sand patterns, etc.

Generally, PVC films are duller than are polyethylene films or polyester films. In the present invention, the PVC film is made duller by use of the additive and subjected to embossing, so as to produce a higher quality ~~with an~~ archaic and elegant expression.



In addition to the delustering function, the plasticizer plays an important role in coating a sheet-like subject with the layered film sheet of the present invention. The subject, for example, a photograph or a print, is placed between the doubled sheet which is folded in such a way that the top PVC layer is externally exposed with an inside existence of the bottom EVA layer. Subsequently, the folded sheet comprising the subject between the doubled facing EVA layers is allowed to pass through a pair of hot engaged rollers in a laminator to give a laminated product. In this regard, the laminating temperature is around 110 °C. Since the folded sheet is transiently passed through the roller at this temperature and the PVC surface is embossed in advance of the complete gelling of the plasticizer added, the embossed patterns do not fade out, but remain unmelted, thereby obtaining a <sup>maximum</sup>~~maximal~~ embossing effect.

The innermost EVA layer, which is brought into direct contact with the subject after the coating, is softened in the temperature range of 40-50 °C by the heat conducted from the surface layer and by the pressure of the engaged rollers and thus adheres to the subject.

When the innermost layer becomes adhesive at high temperatures, resin ink or gelatin, if present on a subject such as a print or a photograph, may be softened or melted to slightly run, thereby spoiling the subject. Accordingly, the



innermost layer is preferably prepared from an EVA resin which is <sup>sticky</sup> ~~of tackiness~~ even at low temperatures.

The recruitment of the soft PVC film as a surface layer enjoys advantages of obtaining an extremely high embossing effect and of providing archaic and elegant texture to the sight by virtue of its lower gloss than ~~have~~ other resin films.

~~It is virtually impossible to emboss~~  
~~Virtual impossibility is imposed on the embossing of~~  
polyester films. It is possible to emboss LDPE films, but while the LDPE films pass through the rollers at such a high temperature, the embossed patterns on LDPE films are melted <sup>and can</sup> ~~to~~ <sup>become</sup> ~~take~~ fade-outs. When this phenomenon is taken into account, the outermost layer is most preferably prepared from PVC.

As for the acryl adhesive, it is applied where two layers, which are poor in reciprocal adhesiveness, are bonded to each other. That is, the adhesive is inserted between the outermost PVC film and the polyethylene film and between the polyester film and the innermost EVA film. In addition, the adhesive layer between the outermost PVC film and the LDPE film functions to reinforce the PVC film which sustains most seriously the <sup>shearing</sup> ~~shear~~ force from the engaged rollers while the adhesive layer between the innermost EVA film and the polyester film maintains the EVA layer in its integrity.

In the meanwhile, the intermediate LDPE film and EVA layers are so flexible that they can be buffed to prevent the



5 deformation or twisting of the sheet, which is apt to occur because of the difference in the coefficient of thermal expansion between the different material layers, the innermost layer and the outermost layer. The intermediate polyester film layer guarantees the sheet to be dimensionally stable by virtue of its excellent thermal resistance. Further, the polyester film layer remains stiff even when the other films are softened by the heat during the coating, so that it can eliminate the problems occurring in a laminator in the absence of such stiffness, for example, a sheet's drooping and clinging to rollers.

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Consequently, layered film sheets for coating sheet-like subjects must be constructed <sup>with</sup> ~~in~~ deliberate consideration of the softening or melting points of the films to be laminated, the adhesiveness among them, the characteristics and functionality the films have when being heated, the reciprocal complementarity among the films, and the relationship to the subject.

20 In the layered film sheet for coating, in accordance with the present invention, as described hereinbefore, the innermost layer, which is brought into direct contact with a subject, is softened and <sup>made adhesive</sup> ~~of adhesion~~ at low temperatures and thus, a decrease can be brought about in the total coating temperature, enabling the outermost PVC film to be expressed  
25 in effective embossed patterns. In addition, such low-

temperature coating prevents the subjects such as pictures, prints, paleography, etc., from being deteriorated by heat. For instance, the low temperature of the coating can <sup>produce</sup> ~~afford~~ a clear product which is free of speckles which result from the spreading or running of gelatin on a photograph or ink on a print when it is melted at high coating temperatures. Further, a subject, when being coated with the layered film sheet of the present invention, can be semi-permanently preserved due to the excellent air tightness of the layered film sheet. Moreover, the employment of the dull and embossed PVC film allows the layered film sheet of the present invention to be of high-toned and archaic texture.

The present invention has been described in an illustrative manner, and it is to be understood that the terminology used is intended to be in the nature of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, it is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.